

CLAIMS

1. A formulation based on the PTFE, homopolymer or modified, comprising:
 - 1) latex of said PTFE having a particle diameter between 5 and 100 nm, comprising an anionic fluorinated surfactant in an amount in the range 2-25% by weight based on the PTFE, preferably 3-20% by weight;
 - 2) a non ionic fluorinated surfactant added to the PTFE latex in an amount in the range 18-60% by weight based on the PTFE, preferably 25-45% by weight.
2. A formulation according to claim 1, wherein the anionic fluorinated surfactants are selected from:



wherein: X=F, CF₃; M=H, NH₄, Na, Li, K;

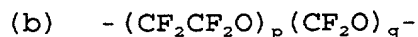
T is a C₁-C₃ (per)fluoroalkyl group, optionally containing one Cl atom; preferably it is selected from -CF₃, -C₂F₅, -C₃F₇, -CF₂Cl, -C₂F₄Cl, -C₃F₆Cl; optionally one or two F atoms can be replaced by H;

R_f is a (per)fluoropolyoxyalkylene radical having a number average molecular weight M_n in the range 200-2,000, preferably 350-1,000; R_f is selected in particular from the following classes:

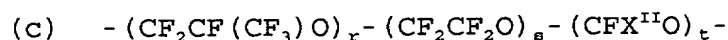
$$(a) \quad -(\text{CF}_2\text{CF}(\text{CF}_3)\text{O})_m(\text{CFXO})_n-$$

wherein m and n are integers such that the n/m ratio

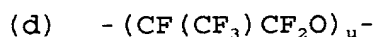
is in the range 0.01-0.5 and the molecular weight is in the above range;



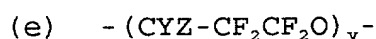
wherein p and q are integers such that the q/p ratio is in the range 0.5-2 and the molecular weight is in the above range;



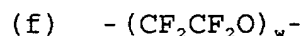
wherein r, s and t are integers such that r+s is in the range 1-50, the t/(r+s) ratio is in the range 0.01-0.05 and the molecular weight is in the above range;



wherein u is an integer such that the molecular weight is in the above range;



wherein Y and Z, equal to or different from each other, are F, Cl or H; v is a number such that the molecular weight is in the above range;



w is a number such that the molecular weight is in the above range.

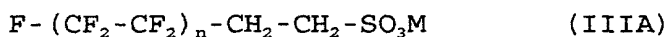
3. A formulation according to claim 2, wherein the anionic fluorinated surfactants (IA) are the compounds having R_f of type (a):



4. A formulation according to claims 1-3, wherein the compounds of formula (IA) are used in admixture with the following anionic surfactants:

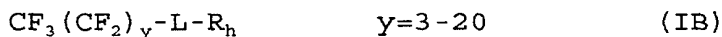


wherein n can range between 4 and 12,



wherein M=H, NH₄, Na, Li, K and n can range between 2 and 5.

5. A formulation according to claims 1-4, wherein the non ionic fluorinated surfactants added to the PTFE polymerization latex have the following structures:



wherein:

R_f is selected from the structures (a), (b), (c), (d), (e), (f) of claim 2;

L is a divalent organic group, a linking group between R_f and R_h, selected from: -CO-NR¹-, -CH₂(OCH₂CHR²)_a-O-,

-CH₂(OCH₂CHR²)_b-O-CO-, -CH₂O-(CH₂)_c-CO-O-, -CH₂-CH₂-O-, -

CH₂-CH₂-; wherein R¹ is -H or a C₁-C₄ alkyl; R² is -H or a C₁-C₂ alkyl; a, b are numbers from 0 to 6, preferably from 0 to 2; c is a number from 1 to 3;

R_h is a radical having a polyoxyalkylene structure sele-

cted from:

- (i) $-(\text{CH}_2\text{CH}_2\text{O})_q\text{CH}_2\text{CH}_2\text{Z}$, wherein: q is an integer from 5 to 70, preferably from 6 to 25; Z is selected from $-\text{OH}$, $\text{C}_1\text{-C}_4$ alkoxy;
 - (ii) $-(\text{CH}_2\text{CH}_2\text{O})_r(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_s\text{CH}_2\text{CHR}^3\text{Z}$, wherein $r+s$ is an integer from 5 to 70, preferably from 10 to 50; the r/s ratio is in the range 0.1-10, preferably 0.5-5; R^3 is selected between $-\text{H}$ and $-\text{CH}_3$; Z is selected between $-\text{OH}$, $\text{C}_1\text{-C}_4$ alkoxy;
6. A formulation according to claim 5, wherein the non ionic surfactants are:
 - the compounds of structure (IB) with $y=5$, $L=-\text{CH}_2-\text{CH}_2-\text{O}-$, $R_h=-(\text{CH}_2\text{CH}_2\text{O})_q\text{CH}_2\text{CH}_2\text{OH}$ wherein $q=6$;
 - the compounds of structure (IIB) having R_f of structure (a) with $T=-\text{C}_3\text{F}_6\text{Cl}$, m and n such to give a molecular weight in the range 450-650; $L=-\text{CONH}-$; $R_h=-(\text{CH}_2\text{CH}_2\text{O})_q\text{CH}_2\text{CH}_2\text{OCH}_3$ wherein $q=21$.
 7. A formulation according to claims 1-6, wherein the PTFE is modified with one or more comonomers containing at least one unsaturation of ethylene type in an amount up to 6% molar, preferably up to 1% molar.
 8. A formulation according to claim 7, wherein the comonomers are of both hydrogenated and fluorinated type.
 9. A formulation according to claim 8, wherein the hydroge-

nated comonomers are selected from ethylene, propylene, acrylic monomers, styrene monomers.

10. A formulation according to claim 8, wherein the fluorinated comonomers are selected from:

- C_3-C_8 perfluoroolefins;
- C_2-C_8 hydrogenated fluoroolefins, such as vinyl fluoride (VF), vinylidene fluoride (VDF), trifluoroethylene, hexafluoroisobutene, perfluoroalkylethylene $CH_2=CH-R_f$, wherein R_f is a C_1-C_6 perfluoroalkyl;
- C_2-C_8 chloro- and/or bromo- and/or iodo-fluoroolefins;
- $CF_2=CFOR_f$ (per)fluoroalkylvinylethers (PAVE), wherein R_f is a C_1-C_6 (per)fluoroalkyl;
- $CF_2=CFOX$ (per)fluoro-oxyalkylvinylethers, wherein X is: a C_1-C_{12} alkyl, or a C_1-C_{12} oxyalkyl, or a C_1-C_{12} (per)fluoro-oxyalkyl having one or more ether groups; fluorodioxoles, preferably perfluorodioxoles.

11. A formulation according to claim 10, wherein the fluorinated comonomers are perfluoromethoxydioxole (MDO), perfluoropropylvinylether (PPVE), perfluoromethylvinylether (PMVE) and perfluoropropene (PFP).

12. Dielectric films obtained from the formulation according to claims 1-11, by the deposition of the formulation on

a substratum, subsequent film sintering at a temperature higher than the PTFE melting T and subsequent air-cooling.

13. Dielectric films according to claim 12, wherein the deposition is carried out by spin coating at a spinning rate in the range 3,000-10,000 rpm for a time comprised between 30 seconds and 5 minutes and in which the sintering temperature is higher than 320°C, preferably in the range 390°C-410°C.
14. Dielectric films according to claims 12-13 having a thickness lower than 200 nm, preferably in the range 50 nm-150 nm, a dielectric constant lower than 2.2, a dielectric strength higher than 4 MV/cm and a weight loss at 425°C in the range 0.0008-0.02%/min.
15. Use of dielectric films according to claims 12-14 for the insulation of conductors in integrated circuits.